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The Regular Monthly Meeting is held on the first Friday of every month, at 8 P. M. A *Conversazione* is held on the third Friday of every month, at the same hour.

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The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Members who cannot be present at the meetings, are requested to send their papers in care of the Committee, who can guarantee prompt publication of all articles accepted.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, if application for the same be made when the article is sent.

Members are requested to notify the Committee of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed in care of

A. A. BRENEMAN, 97 Water St., New York.

PROCEEDINGS OF THE AMERICAN CHEMICAL SOCIETY.

Regular Meeting, September 19th, 1884.

The meeting was called to order at 8:30 P. M. Prof. A. R. Leeds in the chair.

The minutes of the meeting of June 6th were read and approved. The chairman read the titles of recent additions to the library.

The following papers were read: Toughening (Purification) of Gold and Silver in the Crucible. James C. Booth, Ph. D.

Zinc in Drinking Water. F. P. Venable, Ph. D. Discussion by Messrs. Stebbins, Mackintosh, Breneman and Wheeler.

Action of Ammonium Hydrate on the Halogen Salts of Lead. Julian Wood and J. S. Borden of the University of N. C.

Rate of Reversion of Phosphates prepared from Red Navassa Rock, W. B. Phillips, Ph. D.

Reversion of Phosphoric Acid by heat, together with some observations on the fine grinding of analytical samples, W. B. Phillips, Ph. D.

Some Cotton-seed Analysis, E. A. De Schweinitz.

Decomposition of Potassium Cyanide, J. F. Wilkes.

The following gentlemen were proposed for membership: George H. Weiss, 100 Bedford avenue, Brooklyn, E.D., proposed by P. Casamajor, A. A. Breneman, H. Endemann. Conrad Baker, jr., 215 Pearl street, New York; proposed by P. Casamajor, A A. Breneman, H. Endemann.

The meeting was then adjourned.

C. E. MUNSELL,
Recording Secretary.

PROF. HOFMANN'S LETTER.

The following letter from Prof. A. W. Hofmann will explain itself:

10 Dorothea Street, Berlin, June 30th, 1884.

My Dear Sir:—I hasten to acknowledge your kind letter, dated June 12th, announcing to me the new honor conferred upon me by my American friends and colleagues.

And a great honor I consider it to become the successor of my dear old friend Prof. Wöhler. The value I attach to my election into the place made vacant by his death, will be best appreciated by a glance at a short biographical sketch of Wöhler, which I published some time ago, and of which I forward a copy for the library of the Society.

May I ask you, my dear sir, to be, with my new colleagues, the interpreter of my sense of gratitude.

Ever yours most sincerely,

(Signed,) A. W. HOFMANN.

P. Casamajor, Esq.,
Secretary of the American Chemical Society.

TOUGHENING (PURIFICATION) OF GOLD (SILVER, &c.), IN THE CRUCIBLE.

By James C. Booth, Ph. D., Melter and Refiner, U. S. Mint.

In all operations in the Arts, economy, especially the avoidance of needless wastage, is of importance, in direct proportion to the value of the material operated on.

While a loss of 10 per cent. may be and is tolerated in working iron in the fire, the United States Government holds the officers of Mint responsible, in working gold, for any wastage beyond .001 ($\frac{1}{10}$ of one per cent.), and in silver, beyond .0015. In practice, the actual loss is usually far within that range. In general, the tolerance of loss, in working the metals, is inversely as their commercial value.

The recent progress of knowledge and skill, in the Arts, is well shown in the improved commercial character of some of the commoner metals. When I first examined the copper of commerce, in 1850, with reference to its use for minor coinage, or for alloying gold, and silver, coin, I found that a large amount of the best commercial article contained about 98 per cent. copper, and that it often made hard or brittle alloys. We now employ copper averaging 99 per cent. pure, with small quantities of nickel, silver, oxygen, silica, and the usual intruder into everything on earth, iron. In a few instances, 50,000 lbs. of extra refined copper (from Pope, Cole & Co., Baltimore, Md.), yielded, to a specially fine analysis (by Booth, Garrett and Blair), about $99\frac{3}{4}$ per cent. copper. In like manner, a remarkable change has occurred in the silver market. About 1850, the best commercial silver usually assayed 99 per cent., and in 1853, I took credit in exhibiting a pile of about ten tons of silver, that averaged nearly $99\frac{5}{10}$ per cent. At the present time, a large amount of the good silver of commerce, from the mining regions, averages $99\frac{9}{10}$, and sometimes attains $99\frac{95}{100}$; failing only by $\frac{5}{1000}$ of absolute purity.

The gold of commerce generally requires toughening, or purifying, to fit it for coinage, or jeweler's use, as it consists of bars, with silver, somewhat improved by melting,—of lumps and grains of ore, —and of old jewelry, containing tin, lead, zinc, and all the cheap elements that ingenuity, greed, and deception can use to dilute and cheapen the precious metal, without wholly obliterating its coveted

yellow color, and its toughness. Some really tasteful jewelry, of fair quality to the eye, which chooses to judge for itself, contains only one-fourth of gold, and some still less.

The lumps and grains are melted to drive off mercury, &c., and are then refined, together with good silvery bars, by acid processes, termed quartation, or parting. Where tin is present, as in jewelry, the nitric acid process is preferable, and after thoroughly washing out nitrates, muriatic acid, drenching the residue, dissolves out the tin, and the residue is pure gold. Iron is a frequent enemy to the ductility of gold, an extremely small percentage rendering it hard or brittle, as in the case quoted in "Jour. Amer. Chem. Soc., vi. 182." The principle, there developed, is to remove all the embrittling elements, with the least practicable quantity of the valuable metal, on one side (to be subsequently purified); and on the other, to have all the rest of the gold, practically pure. The loss of gold, in the fire, is in proportion to the length of exposure, and to the quantity exposed; and the process described eminently guards these points. A single practical illustration will make the principle clear. Suppose a melt of 5,000 ozs. of gold, containing .001 (5 oz.) embrittling impurity, is separated, by a short working in the fire, into 100 oz. skimmed off impurity (consisting of 95 oz. gold, and 5 oz. of embrittling matter, together with flux), and 4,900 oz. practically pure gold; then only 95 ozs. are exposed to further possible wastage, in the fire.

TOUGHENING, OR PURIFYING, SILVER FROM LEAD, &C.

The principles, and to some extent, the practice, above applied to gold, may be applied to silver, adulterated with lead, tin, zinc, &c.

In spite of the great improvements in preparing silver bars for the market, as noted above, we often received them alloyed with lead, &c., and quite unfit for coinage, some 10 or 15 years ago. Recently they have generally been unexceptionable. There was no reason for having inferior silver in the market, because the Western smelters then had cupels, and knew how to use them, but the lower price of the inferior silver was an irresistible temptation to a purchaser. I bore the brunt of the mistaken purchase, for the question given to me for solution was, to refine a few tons of plumbic silver, without a cupelling hearth; for even if I had desired

one, there was no room for its erection in the Mint. Since I solved the question successfully, and by a rather novel method, it seems to be worth describing. At one time I smelted a lot of some 50,000 ozs. of commercial silver bars, in melts of about 3,500 ozs. each, and treated each melt in the same way, as follows: It was melted, with the addition of about an ounce or more of anhydrous borax, which greatly facilitates fusion, and, to a limited extent, prevents volatilization, although forming only a paper-thick covering to the melted metal. A covering of bone-ash ($\frac{1}{8}$ to $\frac{1}{4}$in. thick), having been sprinkled over the surface, crystals of soda-nitre are here and there dropped through the covering, and after effervescence has somewhat progressed, a black lead dipper, held in the tongs, is moved around the top, in interlacing circles, to spread the oxidation, and the metal is then more thoroughly mixed by plunging the dipper to the bottom of the metal, moving it up and down, once or twice, and, after lifting it out full, by pouring it back into the metal. This operation, of oxidizing throughout, is advantageously repeated, and more than once, if the silver is known to be foul with lead. All these operations being rapidly performed, the surface is hastily skimmed by a triangular crucible (so as to have always a flat side for skimming), experience guiding the melter to take off all the fluxed matter, with as little silver as is conveniently practicable. The whole time of oxidation, and skimming, is of but a few minutes duration, so that no chance is given to the oxidized metals to revert to the metallic condition, in the presence of their tempters, carbon and melted metal. The processes of oxidizing, and skimming, are repeated until the *look* of the remaining silver, or the test of a cast strip, proves sufficient purity of metal. In the case here specially noted, the working of 12 melts occupied between one and one and a-half days to resolve them into over 49,000 oz. of silver sufficiently pure and tough for coinage, and less than 1,000 ozs. of silver with litharge, and other oxides, in the skimmings. These last consist of bone-ash, cemented by litharge, borax and alkali, into mixed soft and hard sponge, or brick, with some grains of silver entangled in the mass.

The treatment of the skimmings constitutes the chief, and, I believe, novel peculiarity of the process. The whole residues having been charged into pots, with the addition of some charcoal, to aid in reducing the litharge, and of pearlash, to make the slags thinner,

was melted in a covered crucible, at a full red heat, and allowed to cool quietly, so as to make a king of all the reduced metal, with a cinder or slag above it. When cold, the slag and cinders were ground and sifted to recover metallic grains. The cold kings were put into a crucible, and gradually heated, by a long continued heat, from below the melting point of lead, to a full red heat, and the eliquated metal, at different heats, collected separately. The first runs were nearly pure lead, so as to be cut with the same facility as the soft lead of commerce.

There was only a slight wastage of silver in all the above operations, and but little loss of lead. I found the whole process a very short method of procuring nearly the whole of the silver from its obstinate alloy with lead, and attended with a trifling wastage; and I have good ground for believing that a little experimental practice might easily lead to its further improvement, so as to be substituted for cupelling, where the latter is not convenient. The depressed hearth of a reverberatory might readily be used as the black lead crucible, and other modifications devised according to the exigencies of the case. These remarks are not designed to disparage the admirable process of cupellation, but merely to show that we are not necessarily confined to the last. In fact, the process I have indicated *is* cupellation, with a movable cupel, and oxysalts used instead of a blast.

It is hardly worth drawing the plain conclusion that where lead is thus removed from silver, zinc, tin, antimony, &c., will be oxidized at the same time, and caught either in the metallic residues (kings,) or as oxides in the cinders. So efficient, economical and easy of execution, is the process, that one leaps to the conclusion that where silver contains one or more of the above oxidizable metals, lead may be added and the whole worked off with ease. Direct trial has proved it.

PURIFICATION OF PHOSPHOR-BRONZE.

The question having been propounded to me about a year ago by a worker in copper alloys, of removing the phosphorus from phosphor-bronze, I applied the principle herein developed, of using the greater oxidizability of the phosphorus and skimming it off, with a cover of lime on the melted metal. Although I had the time of but a half day to test the process, and in spite of no previous experience in skimming, I succeeded so far as to prove that a simple and effectual process can readily be evolved from the hints I have given in this paper.

ZINC IN DRINKING WATER.

By F. P. Venable, Ph. D.

The increase in the use of galvanized iron, especially in the form of water tanks and pipes, has lead to a reopening of the question as to the possible injurious effects from the use of such water. It is a matter of importance then to us how far our knowledge extends on this subject, and I will collect here all of the known facts so far as I have been able to get at them.

The so-called galvanized iron is of course nothing more than iron dipped in a bath of zinc and so superficially coated with it and to a certain extent alloyed with it. The character of the protection afforded the iron is galvanic (hence the name), the two metals forming a galvanic couple, so that under the action of any exciting liquid, the zinc and not the iron is attacked. That zinc dissolves in potable waters has long since been shown by the experiments of Boutigny, Schaueffele and Langonné. Distilled water and rain water dissolve it more readily than hard water. Especially is water containing carbonic acid capable of this solvent action. So much may be taken up that the water becomes opalescent and acquires a distinctly metallic taste. It seems that by the action of water, hydrate and carbonate of zinc are gradually formed, and that this action is more rapid in the presence of certain saline matters, but is weakened by the presence of calcium salts.

As to the injurious effect of such waters, authorities differ. Fonssagrives has investigated the question, consulting the statistics of the French Navy and the recorded experiments of others, adding, however, none of his own. The French Government had, before this, appointed a committee to make a special report on the subject, and the investigations of Roux in 1865 and 1866, furnished evidence enough of possible injury to health from water stored in galvanized iron tanks to lead to an order, from the Minister of Marine, prohibiting the use of such tanks on board of ships of war. Boutigny attributed grave effects to the use of these zinc-containing waters, looking upon it as probably resulting in epilepsy. Fonssagrives, however, maintains that the zinc is not cumulative and produces no bad effects unless taken in large doses. Doubt is thrown on this position, however, by the fact that his assertions as to the limited solubility of zinc in ordinary drinking water are not sustained by experiments. Without doubt such waters have been used for con-

siderable lengths of time and no injurious effects have been noticed. This may have been due, however, to the hardness of the water, and hence the small amount of zinc dissolved. Pappenheim states in contradiction to the assertion of Fonssagrives that zinc vessels are dangerous and must be carefully avoided. Dr. Osborne, of Bitterne, has frequently observed injurious effects from the use of waters impregnated with zinc. Dr. Stevenson[1] has noticed the solvent action of rain water on galvanized iron and states that probably its continued use would cause injury to health. He recommends as a convenient test for the presence of zinc in potable waters, the addition of potassium ferrocyanide to the filtered and acidulated water. Zinc gives a faint white cloud or a heavier precipitate when more is present. Dr. Frankland[2] mentions a case of zinc poisoning where well-water, containing much dissolved oxygen and but little carbonic acid, was used after passing through galvanized iron pipes. Prof. Heaton[3] has recorded the analysis of a spring water in Wales, and a second analysis of the same water after passing through half a mile of galvanized iron pipe, showing that the water had taken up 6.41 grains of zinc carbonate per gallon.

A similar instance of zinc-impregnated water has come under my own observation, and I append the analytical results. The water from a spring 200 yards distant was brought by galvanized iron pipes to a dwelling house and there stored in a zinc lined tank which was painted with white lead. The water became somewhat turbid and metallic-tasting and its use for drinking purposes was discontinued. Analyses were made after the pipes had been in use about one year. A somewhat full analysis of the spring water was made under my direction by Mr. J. C. Roberts. The analyses of water from the tank and directly from the pipe, I carried out only so far as zinc, iron, and tests for lead were concerned. The results are calculated in grains per gallon of 231 cu. in.:

ANALYSIS OF SPRING.

Silica	2.45	grains.
Lime	.23	"
Magnesia	.17	"
Alkalies	.43	"
Chlorine	.35	"
Sulphuric acid	.19	"
Carbon dioxide (calculated)	.45	
Total residue on evaporation	4.34	

1. Chem. News, 49, 107.
2. Chem. News, 49, 115.
3. Chem. News, 49, 85.

The tank contained 4.48 grains of zinc carbonate per gallon with a trace of iron and no lead. Water from the pipe gave 4.29 grains of zinc carbonate per gallon and a trace of iron.

It is evident then, when the dangerous nature of zinc as a poison is taken into consideration, that the use of zinc-coated vessels in connection with water or any food-liquid should be avoided.

Chemical Laboratory, University of N. C.

SOME COTTON-SEED ANALYSES.

By E. A. DeSchweinitz.

The interest attaching to the variation in the percentage of fats yielded by different varieties of cotton-seed, has led to the analysis of several American and foreign seeds, with results as tabulated.

Table I. gives a food stuff analysis of the kernel, and table II. the value of the raw seed as to its ash, and possible yield of fats.

In all cases the fats were extracted with ether, the proteins calculated from the percentage of nitrogen, the fat-free residue was washed with NaHO and $H_2 SO_4$ to find the crude cellulose and the carbohydrates obtained by difference. The calculations are all made on the air-dried seed. Eight varieties in all were examined.

No. 1. Belongs to the botanical species Gossypium hirsutum; generally supposed to be a variety of the Gossypium Barbadense. It is called the "Duncan" cotton, comes from the eastern part of the State, was grown on sandy land with a yield of 400 pounds to the acre.

No. 2. Also Gossypium hirsutum, known as the "Heavy Boll Prolific," was grown on sandy loam in the central part of the State with a yield of 300 pounds to the acre.

No. 3. Gossypium hirsutum, known as "Sea Island" cotton grown for one year on clayey loam in the central part of the State with a fair yield.

No. 4. Is known as the "Hodge" cotton, was grown on sandy upland with a yield of between 300 and 400 pounds to the acre.

No. 5. Known as the "American Cotton Tree," is a variety not cultivated for commercial purposes but grows wild on marsh land in warm districts. The seed shows a noticeably high percentage of ash

and fats. The tree being fairly large probably concentrates a large amount of mineral matter in the seed for its use in germinating.

No. 6. Gossypium Barbadense, is an Egyptain cotton.

No. 7. Belonging to the same variety is from the West Indies ; and No. 8, is from the "Red Cotton" of Southern Russia. These last seeds were small, of a gray color and had a slightly musty odor, showing that they had probably undergone a slight change. This may account for the very low percentage of fats.

Experiments in selecting seed and cultivation with a view to increasing the yield of fats and the nutritive ratio would be interesting and valuable. As the use of a dominant ingredient, potash, in the fertilizer is found to increase the percentage of sugar in the beetroot, so the use of a special fertilizer on the cotton mght be made to increase the value of seed as well as of the fibre. As soil and climate effect the quality and yield of the cotton, so is the seed influenced. The same variety consequently shows variations in different seasons and localities and even in the same field.

I. Kernel.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Moisture @ 100° C.	7.08	7.25	7.50	7.23	6.45	8.81	7.46	6.94
Ash	4.91	4.15	3.51	4.23	5.41	4.96	4.45	4.92
Fats	34.42	40.39	39.76	38.09	44.70	38.54	36.77	32.71
Crude Cellulose	4.70	3.43	4.24	4.21	4.06	4.38	5.12	5.00
Protein Nitro. Matter	30.25	27.94	23.44	27.68	21.62	27.25	28.81	35.18
Carbohydrates, N.-free Extract	13.64	16.84	21.55	18.56	17.76	16.11	17.29	15.25
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Nitrogen	4.84	4.47	3.75	4.43	3.46	4.38	4.61	5.63
Equiv. to NH_3	5.87	5.42	4.55	5.38	4.20	5.29	5.59	6.81
Nutritive Ratio	1:1.90	1:2.17	1:2.80	1:2.19	1:3.07	1:2.13	1:2.05	1:1.50
II. Whole seed—Kernel, Hull.								
Ash	4.26	3.46	3.26	3.40	4.27	3.62	3.47	4.12
Fats	19.71	20.19	19.88	19.04	22.35	19.27	18.38	16.35

Laboratory, University of N. C.

ACTION OF AMMONIUM HYDRATE ON THE HALOGEN SALTS OF LEAD.

By Julian Wood & J. L. Borden.

In Watt's Dictionary (III. 556) we find the statement that by decomposing lead chloride with ammonia a hydrated oxychloride $Pb_4Cl_2O_3 . H_2O$ is obtained. As certain observed facts seemed to disagree with this, a set of experiments were undertaken to determine what oxychloride or oxychlorides were formed by this action of ammonium hydrate and the conditions of formation.

The lead chloride for these experiments was gotten by precipitating pure lead nitrate with hydrochloric acid. The precipitate was thoroughly washed and dried. To about 7 grains of this chloride 140 c. c. of ammonia solution was added, the mixture being heated then some six hours upon a sand bath. The residue was washed, dried and analyzed with the following results :

I. .6200 grams of substance gave .3585 grams AgCl. p. c. Cl.=14.20.

The water was determined and Cl. calculated on a dry basis=14.68.

II. .5003 grams of substance gave .2950 grams AgCl. p. c. Cl.=14.57.

No water in the specimen.

III. .5650 grams of substance gave .3265 grams AgCl. p. c. Cl.=14.29.

Calculated water-free=14.54.

IV. 1.3345 grams of substance gave 1.5340 grams $PbSO_4$. p. c. Pb. 78.52.

Water-free=81.14.

V. H_2O in air dried substance=3.33 p. c.

						I.	II.	III.	IV.	V.
Pb_2	Calculated, p. c.	82.56.	Found, p. c.						81.14	
O	"	" 3.31	"	"						
Cl_2	"	" 14.13	"	"		14.68	14.57	14.54		
H_2O	"	" 3.46	"	"						3.33

Again, between ten and eleven grams of the chloride was heated with 175 c. c. ammonia solution for twelve hours on a water-bath, then washed and dried as before.

I. .145 grams of substance gave .0525 grams AgCl. p. c. Cl.=8.61.

Water-free=8.70.

II. .4935 grams of substance gave .1490 grams AgCl. p. c. Cl.=7.48.

Water-free=7.56.

III. .5035 grams of substance gave .1594 grams AgCl. p. c. Cl.=7.81.

Water-free=7.89.

IV. 1.5353 grams of substance gave 1.9420 grams $PbSO_4$ p. c. Pb=86.31.

Water-free=87.26.

				I.	II.	III.	IV.
Pb_4	Calculated, p. c.	87.53.	Found, p. c.				87.26
Cl_2	" "	7.48	"	8.70	7.56	7.89	
O_3	" "	4.99					

These two experiments, then, would point to the formation of two entirely different bodies, the first having the formula $PbCl_2$. PbO. H_2O., the second the formula $PbCl_2$. $3PbO$. H_2O.

The most plausible explanation of this difference of action seemed to be that in the case of the substance heated upon the sand-bath lthe mixture was kept boiling briskly at the higher temperature, the oss of ammonia was consequently more rapid, and, for a portion of the time, whatever oxychloride had been formed was subjected to the action of a boiling solution of ammonium chloride.

To test the correctness of these results two equal amounts of the chloride (about five grams) were taken, ammonia solution added and the two then heated, one upon the sand-bath and the other upon the water-bath. As the one on the sand-bath was kept at a brisk boil, evaporation was faster and more of the ammonia had to be added to replace that which was thus lost. Hence to the chloride upon the sand-bath 145 c. c. were added, whereas 65 c. c. sufficed for that heated on the water-bath. The object was to keep the ammonia solution strong enough to give always a decided smell of ammonia. Once or twice, however, that upon the sand bath became very weak.

The residue from the sand-bath mixture was washed. The substance was creamy yellow and was unchanged by heating up to 200° C.

I. .5060 grams of substance gave .2745 grams AgCl. p. c. Cl.=13.41. Water-free=13.89.

II. 1.2700 grams of substance gave 1.4730 grams $PbSO_4$ p. c. Pb = 78.45. Water-free = 81.26.

				I.	II.
Pb calculated p. c.	82.56	found p. c.			81.26
Cl_2 "	"	14.13	" "	13.89	
O "	"	3.31	" "		

The formula then is $PbCl_2$. PbO.

The residue from the water-bath was much yellower and became a deep yellow on heating. The analysis gave the following results :

I. .520 grams of substance gave .1370 grams AgCl. p. c. Cl. = 6.51. Water-free = 7.28.

This corresponds with the per centage of chlorine calculated for the tribasic chloride $PbCl_2$. 3PbO.

For the experiments with the iodide conducted by Mr. Borden, lead iodide was prepared by precipitating pure lead nitrate with pure potassium iodide and thoroughly washing and drying the precipitate. In the first set of experiments three portions were taken. One was heated on the sand-bath ten hours, the second a similar time on the water-bath, the third was covered with ammonia solution and set aside for three days at a temperature of 15—20° C. In the first two instances no precautions were taken to keep a strong solution of ammonia over the iodide. In the analyses, lead alone was determined as pointing with sufficient accuracy to the nature of the body formed. Corrections were made for the percentage of water retained in the powders analyzed. Generally two simultaneous lead determinations were made of each substance. The means of concordant analyses are given :

1. Substance heated on water-bath gave ... 62.50 p. c. Pb.
2. Substance heated on sand-bath gave .... 60.11 p. c. Pb.
3. Substance standing in the cold gave .... 58.82 p. c. Pb.

Calculated for PbI_2. PbO, p. c. Pb = 60.51. Calculated for PbI_2. 2PbO, p. c. Pb. = 68.45.

From this it would seem that the ammonia which was only moderately heated had the greatest effect; that which was not heated at all had the least.

In the second set of experiments the heating lasted only seven hours (the mixture stood three days before heating) but care was taken to insure a strong solution of ammonia always covering the iodide. The results were as follows:

1. Substance heated on water-bath gave ...64.13 p. c. Pb.
2. Substance heated on sand-bath gave....63.25 " "

Another set heated ten hours without previous standing were analyzed:

1. Substance heated on water-bath gave...61.60 p. c. Pb.
2. Substance heated on sand-bath gave....60.37 " "

From these results it is seen that the longer ammonia is allowed to act upon the iodide, the more iodine is removed, and hence the more oxide of lead formed. To test this, two portions were taken and the ammonia allowed to act on one for 38 hours (heating it on the water-bath); on the second 68 hours. The analyses were as follows:

1. Substance heated 38 hours gave.....74.10 p. c. Pb.
2. Substance heated 68 hours gave.....78.94 " "

Calculated for PbI_2. 3PbO, 73.26 p. c. Pb; for PbI_2. 4PbO, 76.38 p. c. Pb.; for PbI_2. 5PbO, 79.31 p. c. Pb.

These experiments then would lead to the following conclusions:

1. By the action of ammonia in the cold the monobasic oxyiodide of lead is formed.

2. By heating the solution we get oxyiodides, the basicity of which is determined by the length of heating. If, by the more active boiling upon the sand-bath, the ammonia solution becomes weak, then the tendency is to form the monobasic oxyiodide. The oxide of lead previously formed reacts upon the ammonium iodide, forming lead iodide and setting free ammonia.

In the case of the action of ammonia on lead chloride as examined by Mr. Wood, it seems that the oxychloride formed is not dependent upon the time of heating, but a definite oxychloride is formed whether heated six, ten or fifteen hours, provided the chloride is kept covered with an excess of ammonia. If, by active boiling on the sand-bath, the ammonia solution becomes too much weakened, then a definite oxychloride is formed, independent of the number of hours the solution is heated. Some of Mr. Wood's experiments were repeated to test these conclusions.

Chemical Laboratory, University of N. C., May, 1884.

DECOMPOSITION OF POTASSIUM CYANIDE.

By J. F. Wilkes.

Entomologists frequently find it convenient in killing insects to use a bottle containing moistened potassium cyanide over which plaster of Paris is spread. The insect usually dies in a few minutes after enclosure in the bottle, the mixture assumes a brownish tint and the odor of hydrocyanic acid can easily be detected. As no explanation of this reaction could be found, some experiments were undertaken with a view to deciding the effect of the plaster of Paris and how far it is necessary for the reaction.

To determine the nature of the gas given off, about one grain of pure potassium cyanide (only the chemically pure was used throughout these experiments) was placed in a test-tube, moistened with water and covered with a layer of plaster. Through an accurately-fitting cork two bits of tubing entered this test-tube, one extending nearly to the surface of the mixed substances and having its other end connected with a washing flask containing a strong solution of sodium hydroxide; the other just entered the cork and was connected with a calcium chloride tube to which was joined a tube, 300 m. m. long, filled with mercuric oxide. A smaller tube from the end of this dipped beneath a solution of potassium hydroxide. By means of an aspirator, air was drawn through this system of tubes slowly and at regular intervals for about two days. At the end of this time the potassium hydroxide was tested with the ferroso-ferric solution and no trace of prussian blue could be detected. The calcium chloride and mercuric oxide tubes were then removed and air once more drawn through into a solution of potassium hydroxide. On testing this the reaction for hydrocyanic acid with the ferroso-ferric solution was very clearly given. Here then was proof that hydrocyanic acid and no cyanogen was formed during the reaction. As a confirmatory test, however, hydrochloric acid was added to a portion of the potassium hydroxide through which the gas had been drawn, then sodium hydroxide, and it was heated to boiling. No ammonia could be detected. There was therefore no potassium cyanate present and hence no cyanogen had entered the liquid.

The aqueous solution of potassium cyanide can be kept unaltered in closed vessels at ordinary temperatures according to Pelouze and Geiger (Gmelin's Hand-book, vii, 415), but when boiled it is resolved into ammonia and potassium formiate. It is well known that a strong

smell of ammonia can be detected on opening a bottle containing moist cyanide, but we have seen no mention of the formation of hydrocyanic acid from the cyanide by simple decomposition without the aid of carbon dioxide or any strong acid. It was noticed during these experiments that when moistened potassium cyanide was enclosed in a test-tube and air aspirated over it for several days a slight but distinct prussian blue test was given by the solution of potassium hydroxide through which the air after leaving the tube was drawn. Of course every precaution was taken to free the air from all traces of carbon dioxide or acid. It was made to pass through a wash bottle containing a concentrated solution of sodium hydroxide, then through two U tubes filled with small lumps of solid hydroxide, and lastly, to have proof of the absence of carbon dioxide, through a small tube containing lime water, passing thence into the tube containing the cyanide. This experiment was repeated at various temperatures ranging from 12°—18° C. and always with the same result. If the amount of moisture was small, the depth of color gotten in the ferroso-ferric test was slight. If about 1 c.c. of water was used to 1 gram of the cyanide a clear deep green was gotten. With calcium carbonate, ordinary hydrated calcium sulphate or barium sulphate, the cyanide when mixed in about equal parts and moistened gave off apparently about the same amount of hydrocyanic acid as when alone, judging from the depth of color in the ferroso-ferric test. With the anhydrous sulphate a distinct blue was gotten, showing a decidedly increased decomposition, and in this case the mixture left in the tube had a purplish brown color which was not observed with the others.

Since other sulphates and other calcium compounds failed to act on the potassium cyanide and no change in the anhydrous sulphate itself could be detected, it seemed probable that its action was due in some way to its power of combining with a portion of the water present to form the hydrated sulphate. When an excess of water, 3–5 c.c., was added to the mixture of the cyanide and the anhydrous sulphate, the test showed very little, if any, more hydrocyanic acid to be given off than when the hydrated sulphate or the cyanide alone was used and no discoloration was produced. When barely moistened the evolution of hydrocyanic acid was considerable. If porous, partially dehydrated calcium chloride was added to the cyanide in the place of the sulphate the amount of acid

evolved was still greater and the color of the mixture almost black. Anhydrous sodium carbonate had the same effect, though in a lesser degree. Again, when the cyanide and the plaster had both been carefully dried the air was drawn over them for four days and no hydrocyanic test could be gotten in the final tube of potassium hydroxide.

The mixture of potassium cyanide and anhydrous calcium sulphate left after two or three days of aspirating was examined and found to contain potassium hydroxide. The reaction then is probably

$$KCN + H_2O = HCN + KOH.$$

It has been shown by Karsted (Poggendorff's Annalen, 115,348) and Storer (Amer. Chem. Journal v. 69) that where air alone comes in contact with corks and organic connectors carbon dioxide is formed. This would probably account for decomposition when potassium cyanide and water alone were used, but the greatly increased depth of test when plaster of Paris is added shows a decided action on the part of that body.

Chemical Laboratory, University of N. C.

RATE OF REVERSION IN SUPERPHOSPHATES PREPARED FROM RED NAVASSA ROCK.

By W. B. Phillips, Ph. D.

The manufacture of a high grade superphosphate from Red Navassa rock is one of those problems which, appearing easy of answer, yet present great difficulties. How great these difficulties are, only the manufacturer knows. Working formulæ which on other natural phosphates give entire satisfaction, on red Navassa give curious and rather discouraging results. In this rock we have to deal with a mixture of the phosphates of calcium, iron, and aluminium, and the oxides of iron, and aluminium. The superphosphate made from it is consequently of a more complicated structure than that made almost entirely of tri-calcium phosphate, i. e., from bone, or Apatite, or Charleston Rock.

In the superphosphate itself, the rapidity with which reversion takes place is largely dependent upon the content of iron and

aluminium. In most cases, if all the phosphoric acid has been rendered soluble, the reversion proceeds slowly. But if any unattacked iron and aluminium oxides are present, the reversion proceeds rapidly. (Compare H. Joulie, Compt. Rendus 88, 1879, p. 1324, and Carl Ferd. Meyer, Zeit. An. Chem. 1880, p. 309.)

I have recorded in the following tables the results of some observations made on superphosphates prepared from red Navassa rock. The material used was of uniform fineness, the whole of it passing through a 60 mesh sieve. The samples were prepared so that in one there should be about 5 per cent., in another about 8 per cent., and in the third about 14 per cent. soluble phosphoric acid.

The same method of analysis was used in every case. All the phosphoric acid determinations were made with ammonium molybdate. For the estimation of insoluble phosphoric acid there was used a slightly alkaline solution of ammonium citrate, 100 c. c. to 2 grms., time 30 mins. Some of the comparative determinations of insoluble phosphoric acid had to be omitted from lack of time, but it is hoped that those that appear will prove to be sufficient for the end in view. The reverted phosphoric acid was determined by difference.

TABLE I.

Calculated on dry basis,	3d day after Mixing.	10th day after Mixing.	17th day after Mixing.	4th week after Mixing.
	Per cent.	Per cent.	Per cent.	Per cent.
Total Phosphoric Acid.....	19.42	19.42	19.42	19.42
Soluble " "	4.68	4.08	4.65	3.36
Insol. " " 40°	7.04	4.46	3.59	5.37
" " " 60°	4.15	3.48	3.50	5.03
" " " 100°	1.96	3.81	2.86	....
Reverted " " 40°	7.70	10.88	11.18	10.09
" " " 60°	10.59	11.86	11.27	11.03
" " " 100°	12.78	11.53	11.91	....
Available " " 40°	12.38	14.96	15.83	13.45
" " " 60°	15.27	15.94	15.92	14.39
" " " 100°	17.46	15.61	16.56	....
Moisture.....	32.85	29.63	24.07	21.50

TABLE II.

Calculated on dry basis.	At Mixing.	End of 3d week.	End of 4th week.	End of 5th week.	End of 6th week.	End of 7th week.	End of 8th week.	End of 9th week.	End of 10th week.	End of 11th week.	End of 12th week.	End of 13th week.	End of 14th week.
Total Phos. Acid....	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77	p. c. 21.77
Sol. " "	7.83	6.16	5.40	5.10	5.02	4.17	3.79	3.49	3.10	3.17	3.09	3.04	3.25
Insol. " " 60°	8.46	8.72	9.06	8.71	8.58	8.05	7.24	7.86	8.09	8.18	7.63	7.32	7.66
" " " 100°	..	8.76	8.97	8.34	8.03	7.99	7.34	7.82	7.83	7.57	7.68	7.24	7.60
Rev'd " " 60.	5.48	6.89	7.31	7.96	8.17	9.55	10.74	10.42	10.58	10.42	11.05	11.41	10.86
" " " 100°	..	6.84	7.40	8.33	8.72	9.61	10.64	10.46	10.84	11.03	11.00	11.49	10.91
Avail. " " 60°	13.31	13.05	12.71	13.06	13.19	13.72	14.53	13.91	13.68	13.59	14.14	14.45	14.11
" " " 100°	..	13.00	12.80	13.43	13.74	13.78	14.43	13.95	13.94	14.20	14.09	14.53	14.17
Moisture.....	31.49	26.16	30.77	16.14	12.41	8.22	6.01	5.17	5.22	6.86	6.03	5.36	6.10

TABLE III.

Calculated on Dry Basis.	At Mixing.	End of 1st week.	End of 2d week.	End of 3d week.	End of 4th week.
Total Phosphoric Acid.....	Per cent. 20.17	Per cent. 20.17	Per cent. 20.17	Per cent. 20.18	Per cent. 20.17
Soluble " "	14.02	15.42	12.57	12.20	11.60
Insoluble " " 40°.....	1.28	.94	.94	.32	.42
" " " 60°.....	....	.77	.76	.42	....
" " " 100°.....	....	.63	.39	.41	....
Reverted " " 40°.....	4.87	5.81	6.66	7.65	8.15
" " " 60°.....	....	5.98	6.84	7.55	....
" " " 100°.....	....	6.12	7.21	7.56	....
Available " " 40°.....	18.79	19.23	19.24	19.85	19.75
" " " 60°.....	....	19.40	19.41	19.75	....
" " " 100°.....	....	19.54	19.78	19.76	....
Moisture.....	41.61	30.20	30.19	29.29	28.90

The sample yielding about 8 per cent. soluble phosphoric acid was examined through a much longer time than either of the others. For comparison, therefore, we must consider them at the end of the same time, i. e., at the end of the fourth week. During this time, as indeed throughout the experiment, the samples worked on stood in large earthenware pans in the laboratory and were protected from dust.

Table IV. shows the rate of reversion for 4 weeks, absolute and comparative, and the accompanying loss of moisture :

TABLE IV.

	At Mixing.	4 weeks. after Mixing.	Loss of Soluble.	Reverted p. c. of Original Soluble.	Loss of Moisture in 4 Weeks.	Loss of Moisture p. c. of Original.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Soluble Phosphoric Acid.	4.68	3.36	1.32	28.21	11.35	34.55
" " "	7.83	5.40	2.43	31.03	10.72	34.05
" " "	14.02	11.60	2.42	17.26	12.75	30.61

TABLE V—COMPARE TABLE II.

BEHAVIOR OF INSOL. PHOS. ACID.

+ denotes gain.				— denotes loss.			End of Weeks.				
3	4	5	6	7	8	9	10	11	12	13	14
+ p. c. .26	+ p. c. .60	+ p. c. .35	+ p. c. .12	— p. c. .41	— p. c. 1.22	— p. c. .60	— p. c. .37	— p. c. .28	— p. c. .83	— p. c. 1.14	— p. c. .80

TABLE VI—COMPARE TABLE II.

BEHAVIOR OF SOLUBLE AND REVERTED PHOS. ACID, 60°.

	3d week.	4th week.	5th week.	6th week.	7th week.	8th week.	9th week.	10th week.	11th week.	12th week.	13th week.	14th week.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Loss of Phos. Acid	1.67	2.43	2.73	2.81	3.66	4.04	4.34	4.73	4.66	4.74	4.79	4.58
Gain Revt'd "	1.41	1.83	2.48	2.69	4.07	5.26	4.94	5.10	4.94	5.57	5.93	5.38

The most striking fact brought out by these tables is that the insoluble phosphoric acid is not stationary, but oscillates from week to week. Thus from Table V. it is seen that this oscillation of insoluble phosphoric acid is from a gain of .60 per cent. to a loss 1.22 per cent., the interval between being four weeks.

The oscillation of insoluble phosphoric acid has been touched upon by J. Post, (Chem. Industr. 1882, p. 217), who states, among other most interesting facts, this, that during the first month the

phosphates which have become insoluble in water remain soluble in citrate at 40°; but later on a part of the reverted phosphoric acid insoluble at 40° becomes insoluble in citrate even at 90°. In other words, the per cent. of insoluble phosphoric acid varies from time to time. In reflecting upon this subject, there was reason to suspect that this variation was largely controlled by the mechanical condition of the analytical sample. Some experiments were begun on this point, but could not be carried through, owing to the pressure of routine work. In passing an article of 6 per cent. or 8 per cent. moisture through a 40 mesh sieve, a good deal of it must necessarily be pulverized finer than the sieve. The less moisture the article holds, other things being equal, the more will there be of it much finer than the seive. The citrate acts upon this fine stuff more effectually than upon the coarser, and in this way the variation of the insoluble phosphoric acid may be partially explained. Doubtless this has some effect, for from the 7th through the 14th week, Tables II. and V., when the moisture varied from 8.22 per cent. to 5.17 per cent., there was a loss of insoluble phosphoric acid all the time.

Other interesting points might well be considered did this space allow. Such as they are the careful reader will recognize. It is hoped to follow up this discussion with some parallel observations as soon as possible.

Laboratory of the Navassa Guano Company,
Wilmington, N. C.

REVERSION OF PHOSPHORIC ACID BY HEAT, TOGETHER WITH SOME OBSERVATIONS ON THE FINE GRINDING OF ANALYTICAL SAMPLES.

W. B. Phillips, Ph. D.

When manufactured phosphates are analyzed immediately after preparation, the percentage of phosphoric acid soluble in water is generally found to be higher than at any subsequent time. A portion of it becomes insoluble in water, but is soluble in some of the organic salts of ammonia; i. e., in the oxalate and citrate. To this phosphoric acid the term *reverted* is applied, signifying, as is well known, phosphoric acid which, though at one time soluble in water, has become insoluble in that liquid, and occupies an intermediate position between the original tri-calcium-phosphate of the crude material, and the tetra-hydrogen-calcium-phosphate of the manufactured product.

The change from soluble to reverted begins almost at the very moment of manufacture, and continues for an indefinite period, varying among other things with the raw material used, the quantity of acid employed, &c., &c.

It might be supposed that as this reversion begins when the product begins to dry, it was connected intimately with the process of drying. But it has been shown by Post (Chem. Industr. 1882, p. 217,) that it goes on even in samples enclosed in hermetically sealed bottles, and hence is not dependent on the loss of moisture, under ordinary conditions of temperature.

The limits of this paper will not allow me to enter at all into the discussion of the various causes of reversion. Among the more prominent ones are the presence of unattacked oxides of calcium, iron, and aluminum, and calcium sulphate and carbonate.

The object of this paper is to direct attention anew to the fact that a temperature of 100° C, maintained for varying lengths of time on the manufactured phosphates, causes a very rapid reversion.

The material used was a sample of an "Acid Phosphate" prepared under my personal supervision at the works of the Navassa Guano Company. It was prepared as follows:

Fine ground Charleston Rock	1,100 pounds.
Sulphuric Acid, 470 B	950 "

Several tons of it were made November 21st, 1883, and a sample of it was drawn by myself, November 22d. The sample was pulverized by hand as fine as possible, and analyzed at once.

Fifty grains of the sample were then taken and dried at a temperature of 90°–100° C. for two days. At the end of that time a sample was drawn, pulverized until it passed through a sieve of 100 meshes per square inch, and analyzed.

The drying was continued for eight (8) days longer, at the end of which time a sample was drawn, passed through a 100 mesh sieve, and analyzed.

Tabulating these results for convenience of reference we have :

On a Dry Basis.	A 24 hours after preparation, pulverized by hand.	B After 2 days at 90°—100° c. Through 100 mesh sieve.	C After 10 days at 90°—100°c. Through 100 mesh seive.
Total Phosphoric Acid....	17.31 per cent.	17.13 per cent.	17.32 per cent.
Soluble " "	11.74 " "	10.59 " "	7.48 " "
Insoluble " "	3.32 " "	2.95 " "	2.85 " "
Reverted " " ...	2.25 " "	3.59 " "	6.99 " "
Available " "	13.99 " "	14.18 " "	14.47 " "

We have here a loss of 4.26 per cent. of sol. phos. acid in days, a loss of .47 per cent. of insol. phos. acid, and a gain of 4.74 per cent. of reverted. Ordinarily the loss of soluble is compensated by the gain of reverted, while the insoluble remains about the same. Post, in the article before referred to, claims to have found that in the course of six (6) months, in sealed bottles, some of the soluble becomes so insoluble as not to be dissolved by ammonium citrate at 90° C. But here it is shown that in ten (10) days at a temperature of 90—100° C, some of the originally insoluble phosphoric acid, viz: .47 per cent. has *become soluble in ammonium citrate at* 40° *C.*, that is, has changed to reverted! But this loss of .47 per cent. of insoluble phosphoric acid is doubtless due to the very fine grinding of the dry samples. For the difference in insoluble phosphoric acid between the first and second analyses is .37 per cent., while the difference between the second and third is only .10 per cent. That is to say, the difference between the insoluble phosphoric acid in the sample pulverized by

hand and the sample dried for two (2) days and then passed through a 100 mesh sieve, is .37 per cent. in favor of the finely pulverized. But the difference between the two finely pulverized samples after eight (8) days of drying is only .10 per cent.

That the ammonium citrate should dissolve more phosphoric acid from the finely ground sample is just what was to be expected. When sufficient sulphuric acid is added to the crude tricalcium phosphate to render *all* of the phosphoric acid soluble in water reversion does not appear to proceed as rapidly as when there is present some of the original undecomposed phosphate. But in this case, when using Charleston rock, it is very difficult to obtain a product which will dry in a reasonable time without the aid of artificial heat, or some carbonate as a dryer. Using artificial heat there is great danger of hastening reversion, and the same is true if some chemical "dryer" is used, to say nothing of the reduction of the content of total phosphoric acid in this latter case.

There is one point to which I wish to direct especial attention, and that is what I conceive to be the *necessity for fine grinding of the analytical sample.* Plants derive their food from the soil in solutions, and in these solutions the food is in a state of almost inconceivable fineness.

In estimating the value by chemical analysis of any plant food, we should, as far as practical, approximate to the degree of fineness to which the food must be reduced before the plant can use it.

Other things being equal, the finer we grind analytical samples before acting upon them with chemical reagents which in a greater or less degree represent the action of the soil the nearer do we approach to the methods of nature.

Laboratory of Navassa Guano Company,
Wilmington, N. C., Dec. 6th 1883.

ABSTRACTS.

GENERAL AND INORGANIC CHEMISTRY.

Note on the Molecular Volumes of Some Double Chlorides. R. ROMANIS.

The mol. vols. of the anhydrous double Chlorides K_2SnCl_6 and $(NH_4)_2SnCl_6$ are respectively 138.6 and 146.1 and the contraction as compared with the vols. of the constituent chlorides, 38 and 54.5, agreeing very closely with the corresponding platinochlorides. In the case of the chlorides $(NH_4)_2PtCl_4$, $(NH_4)_2ZnCl_4$ and K_2SnCl_4, expansion occurs, the mol. vols. being larger than the sums of the vols. of the constituent chlorides. In K_3SbCl_6 2. H_2O the mol. vol. is 200.8 and the contraction 52.6. (*Chem. News, XLIX.* 273.) A. A. B.

Spectroscopic Examination of Vapors Obtained on Heating Iron and Other Metals at Atmospheric. J. PARRY.

The metals were heated to fusion, and the spark passed through the vapors evolved. Spectra obtained with Fe. Mg. Cu. &c. are described. (*Chem. News, XLIX.* 234.) A. A. B.

Chemical Phenomena of the Respiration of Plants. T. L. PHIPSON.

In a previous paper (*Chem. News XLVIII.* 205.) the author has described experiments upon the respiration of unicellular algae submerged in a solution of CO_2. He now finds that the conclusions then formed apply to unicellular algae in general, and, probably, to all plants except fungi. The evolution of oxygen in spring water is less active after renewal of the supply of CO_2 which has been once exhausted, and spring water boiled with certain precautions and then impregnated with CO_2 does not permit such respiration, The phenomenon of respiration requires presence of H_2O_2 of which spring water contains an abundance; probably 6 to 8% of the oxygen yielded by boiling it has existed as H_2O_2. The author promises the proof of this conclusion in another paper.

MnO_2 exposed to sunlight in spring water can be made to *breathe* like the unicellular algae.

(*Chem. News, L.* 37.)

A. A. B.

Recent Estimations of the Amount of Salicylic Acid in the Cultivated Pansy. A. B. GRIFFITHS and E. C. CONRAD.

Salicylic acid was first discovered in plants by Piria in 1838 and later (1844) was found by Gerhardt and Cahours in wintergreen (*gaultheria procumbens*). Mandelin finds this acid or acids of the $Cn\ H_{2n-8}\ O_3$ series in the Violaceae generally.

The authors find salicylic acid in the common garden pansy in the following proportions:

Leaves,	per cent.	.1329
Stems	"	.0854
Roots,	"	.0530

The flowers contain only a trace. Microscopic examination fails to discover crystals of the acid in the cells of the plant and its production and function in the plant are still unexplained. (*Chem. News*, *L* 102.) A. A. B.

On the Physiology of the Carbohydrates in the Animal System. F. W. PAVY.

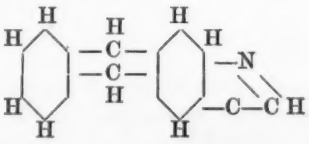
An investigation undertaken with the object of ascertaining the changes undergone by the four chief carbo-hydrate elements of food, viz: grape sugar, cane sugar, lactine and starch, during digestion. Beginning with the stomach, the attempt is made to follow the changes in these substances as they proceed towards absorption up to their arrival within the portal system of vessels. The experiments were performed upon the digestive organs of freshly-killed rabbits, portions of the stomach or intestines being left in contact, for a given time, with solutions of known weights of the carbohydrate in question, and the copper-reducing value of the substance, after this digestion, was compared with that which it had been found to have before contact with the animal substance. Inasmuch as grape sugar is characterized by the property of possessing the same reducing power after treating with sulphuric acid as before, while the carbo-hydrates which represent steps in an operation of which glucose is the final product, are altered in reducing power by the action of the acid, the author took the precaution to boil one portion of the modified liquid with sulphuric acid in all cases before estimating the reducing power. The copper-reducing value of the digested liquid may thus be compared with that of glucose, while the relation of the modified product to glu-

cose is also ascertained. The most striking results of these experiments is the indication that transformation of glucose into bodies of lower reducing power is possible under the influence of a ferment existing in the stomach and intestines. Boiling of the animal substance with water previous to the experiment was found to annul the action of this ferment. The latter body seems to exist rather within the walls of the vessels examined than upon the mucous surface. So far as the experiments have gone, the author regards them as indicating that this ferment is more abundant in the stomach and intestines of the rabbit than of those of the dog, cat, horse, sheep or pig. (*Chem. News*, *XLIX.*, 140.) A. A. B.

ORGANIC CHEMISTRY.

Synthesis of Anthrachinoline. C. Graebe.

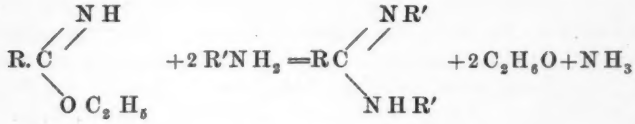
After Skraup had shown that β-naphthylamine on being treated with glycerine, sulphuric acid and nitrobenzole, was converted into β-naphtochinoline, it seemed probable that anthramine, under the same conditions, would yield anthrachinoline. This investigation was undertaken with the view of determining whether, in this case, the same product would be obtained as that derived from alizarine blue by heating it with zinc dust. Previous examination led the author to believe that the anthrachinoline derived from alizarine blue has the following composition :



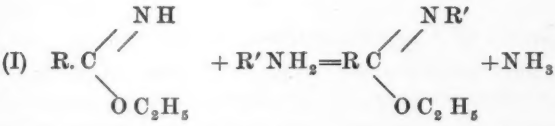
Now, as the amido-group in anthramine was supposed to hold the same position as the nitrogen atom in alizarine blue, it was therefore probable that anthramine would yield the same anthrachinoline. This was fully verified by experiment. An anthramine melting at 170° C is. obtained. It forms yellow colored salts which, in solution, possess a very strong green fluorescence. (*Ber. d. chem. Ges. 1884, 170.*) J. H. S., Jr.

Upon the Action of Phenylhydrazine upon the Imido-ethers. (Azidines.) A. PINNER.

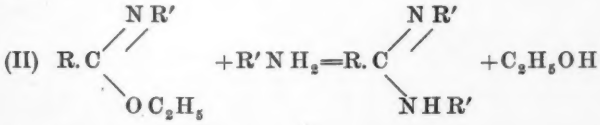
It is known that all primary amines react with the chlorides of imido-ethers in such a manner that symmetrical, di-substituted amidines result therefrom, viz :



This reaction takes place (as the author has shown) more or less rapidly in two consecutive phases, viz :



At first the imido-group is exchanged for the remainder of the amine group, and then only is the oxyethyl group replaced by a second, univalent amido-radicals, viz :



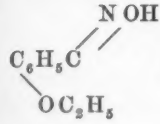
It was therefore to be expected that, with the aid of the hydrazines, analogous reactions would take place. For this reason phenylhydrazine was treated in alcoholic solution with the chloride of benzimido-ether.

The author calls the first class of these compounds "azido-ethers," and the second class "azidines."

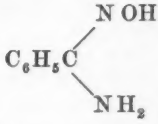
In reality the above reactions take place when a solution in absolute alcohol of about 2 mols. phenylhydrazine are added to an alcoholic solution of the imido-ether chloride. (*Ber. d. Chem. Ges. 1884, 182.*) J. H. S., JR.

Upon the Action of Hydroxylamine upon the Imido-ethers and the Amidines. (Acidoximes.) A. PINNER.

It was found that hydroxylamine united readily with benzimido-ether and benzamidine to form benzoximido-ether



and benzoxamidine, viz:



(*Ber. d. ch. Ges. 1884, 184.*)

J. H. S., JR.

On Paradibromchinoline. SIGMUND METZGER.

The original material in this investigation was benzene, which, at a boiling temperature, was treated with 8 pts. of bromine. Paradibrombenzole (M. P. 89° C.) was thus obtained. This was converted into the nitro-compound by treating it with hot nitric acid. The mononitroparadibrombenzole was converted into paradibromaniline by reduction. 5 grms. paradibromaniline, 12 grms. nitrobenzole, 60 grms. glycerine and 50 grms. conc. H_2SO_4 were heated to-together for 5 hours. The melt was diluted with water and treated with steam, which carried over a compound which proved to be paradibromchinoline (M. P. 127°–129° C.). (*Ber. d. ch. Ges. 1884, 186.*)

J. H. S., JR.

On Parachinoline Sulpho-Acid. JOSEPH HAPP.

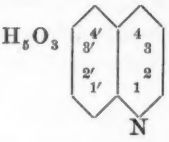
The only sulphur acids of chinoline now known are the ortho- and meta-sulpho-acids which have the following structure:

Ortho sulpho-acid. 1:1′

Meta sulpho-acid. 1:4

A para sulpho-acid should therefore be produced, if sulphanilic acid were treated with glycerine, nitrobenzole and sulphuric acid.

The para sulpho-acid obtained by the author has the following structure:



It consists of highly refracting, shining crystals, which are quite stable. It dissolves with difficulty in cold, but more easily in hot water. The aqueous solution reddens litmus paper. It unites easily with bases to forms salts. (*Ber. d. chem. Ges. 1884, 191.*)

J. H. S., Jr.

On Derivatives of β-Dinaphtylamine. Ch. Ris and A. Weber. (Dinitro-β-Dinaphtylamine.)

This was obtained by treating the base, dissolved in glacial acetic acid, with fuming nitric acid. This body crystallizes from cumene in yellow red needles, which melt at 224–225° C.

Tetranitro-β-dinaphthylamine.

This compound is formed at the same time as the previous one and almost exclusively, if nitration is performed without cooling the mixture. Crystallizes from nitrobenzole in little yellow crystals. M. P. 285–286° C. (*Ber. d. chem. Ges 1884, 197.*)

J. H. S., Jr.

On Chrysaniline. O. Fisher and G. Thörner.

The authors found that chrysaniline is a diamidophenylacridine, as they were enabled to obtain not only phenylacridine from chrysaniline, but also to produce the latter in a new way, synthetically. The material used in these experiments was Oehler's phosphine, which, after being purified, crystallizes in long, golden yellow needles.

Chrysophenole.

This was obtained from chrysaniline by heating it, under pressure, with 3–4 pts. strong H Cl. The following reactions then take place:

$$C_{19}H_{15}H\,Cl+H_2O=C_{19}H_{15}N_2O+NH_4Cl,$$
$$\text{or } C_{20}H_{17}N_3H\,Cl+H_2O=C_{20}H_{17}N_2O+NH_4Cl.$$

Phenylacridine.

The formation of this compound from chrysaniline is a proof that the latter has the formula $C_{19}H_{15}N_3$. 10 grms. chrysaniline were dissolved in 50 grms. conc. H_2SO_4, the mixture cooled, and then treated with a stream of nitrous acid until an excess of the latter predominates. The diazo-compound thus formed was poured into 600 grms. of boiling absolute alcohol, and, after the evolution of nitrogen has ceased, an intensely yellow green, fluorescing solution was obtained. The alcohol was distilled off, and the acid solution, after being diluted was treated with an alkali which threw down a precipitate consisting of reddish flakes. These were then treated with a current of steam. A substance was thus obtained melting at 181°, which turned out to be phenylacridine. It will therefore be seen that chrysaniline is a diamidophenylacridine.

Synthesis.

E. Renouf, a short time since, found, on treating orthonitrobenzaldehyde with aniline, that a compound was obtained which he called orthodiparatriamidotriphenylmethane, and that this body, on oxidation with arsenic acid, yielded a brown coloring matter. The authors found, on treating this triamidotriphenylmethane with arsenic acid at 180–200° C, that chrysaniline is formed. (*Ber. d. ch. Ges. 1884, 203.*) J. H. S., JR.

Chlorophyll Probably a compound of Iron with one of the Glucosides. A. B. GRIFFITHS.

From recent researches of E. Schunck upon chlorophyll (Proc. Roy. Soc. **36**. 183) and from those of the author upon the value of iron, as ferrous sulphate, to plants, (This Journal, vol. VII. 77) the attempt is made to justify the conclusion suggested in the above title. (*Chem. News, XLIX.* 237.) A. A. B.

The Chlorination of Pyrogallol. C. S. WEBSTER.

The first stage in chlorination of pyrogallol (in solution in glacial acetic acid) is found to be trichlorpyrogallol, $C_6OCl_3(OH_3)$ which crystallizes in needles with $3H_2O$. (*Chem. News, XLIX.* 140.) A. A. B.

ANALYTICAL CHEMISTRY.

On the Estimation of Boracic Acid in Borosilicates. C. Bodewig.

The estimation of boracid acid as such, or in simple borates, is of no particular difficulty, provided the re-agents, (especially hydrofluoric acid) are pure. The estimation becomes much more difficult in the presence of SiO_2.

In order to separate both acids, the mineral is fused with 4 times its weight of a carbonate, then extracted, first with water, afterwards with water to which a little ammonium carbonate has been added. It may then be washed, and the SiO_2 precipitated, by the addition of ammonium sesquicarbonate, or auminic chloride. The ammonium sesquicarbonate is added in portions of 2½ pts., until the carbonates are converted into bicarbonates. The ammonium carbonate thus obtained, is mostly expelled by heating on a water-bath, and the SiO_2, washed with water. By this means a certain amount of SiO_2 remains dissolved in the alkaline fluid, which, after expelling all the ammonium carbonate, may be precipitated, by adding zinc oxide, dissolved in ammonia. (Of course the ammonia must first be driven off by evaporation.)

(*Fres. Zeit. 1884. 113.*)

J. H. S., Jr.

On the Quantitative Estimation of Quartz in Rocks and Clays. J. Hazard.

The method depends upon the decomposition of silicates on being treated with dilute sulphuric acid, under high pressure.

(*Fres. Zeit. 1884. 158.*)

J. H. S., Jr.

On the Estimation of Nitric Acid, in the Presence of Other Acids, which mask its Reactions. Antonio Longi.

The estimation of nitrates in the presence of iodides, bromides, chlorates, bromates, etc., is not only difficult, but at times apt to produce grave errors. The author has now found a method, which depends upon the reduction of the oxygen acids, and the elimination of bromine, but more especially of iodine. The reduction of the oxygen acids, is effected with SO_2. The bromine and iodine

are eliminated by G. Vortmann's reaction. In solutions containing besides the oxygen acids above mentioned, also ammonium salts, a part of the NH_3 becomes oxidized to nitric acid. In such cases, reduction must take place in the cold.

The solution to be examined, if acid, is first neutralized with Na_2CO_3, and then treated with SO_2, until it smells strongly of the latter. When reduction is complete, the solution is heated to expel excess of SO_2. Then add Na_2CO_3 to slight alkaline reaction and heat to boiling, until chromium, and the other heavy metals, have been precipitated. Filter, if a precipitate is formed, and acidify with acetic acid, to the solution now add a little acetic acid and lead peroxide, and boil till further addition of $HC_2H_3O_2$ and lead peroxide produces no fumes which color starch paper. The solution is then allowed to cool and filtered to separate the excess of lead peroxide. Any lead in solution is precipitated with sodium sulphate, and filtered. The filtrate is evaporated to dryness, the residue is dissolved in water, filtered if necessary, and then tested for nitric acid, with the usual reagents.

(*Fres. Zeit. 1884. 149.*)

J. H. S., Jr.

On a Simple Quantitative Method of Estimating Nitric Acid. E. Wildt & A. Scheibe.

This method is a modification of Schloesing's process, *i.e.*, reduction of the nitric acid, to nitric oxide, which is collected in a glass bell jar, and afterwards oxidized back to nitric acid by adding oxygen. The author uses an apparatus of peculiar construction.

The liquid to be examined is first heated to drive off air and after 15 or 20 minutes boiling a solution of ferrous chloride is run into the flask. After a few minutes the contents of the flask will turn brown, indicating reduction. The liquid is now heated to gentle boiling, and the nitric oxide generated, is freed from H Cl by passing through a flask containing KOH. It then passes into a receiver, or gas holder, where it is oxidized back to nitric acid by the action of the oxygen of the air, and steam. The HNO_3, is then estimated in the usual way by titration.

(*Fres. Zeit. 1844. 151.*)

J. H. S., Jr.

Estimation of Phosphoric Acid.

A report of the sub-committee of the Chemical Trade Section of the London Chamber of Commerce gives the following results of analyses of a sample of Charleston phosphate submitted to five different analysts:

Phosphoric acid	26.55	26.20	26.48	26.60	26.00
Equal to phosph. lime	57.56	57.19	57.82	58.06	56.75

Four of the results were obtained by the magnesium method, the fifth is a mean of two determinations, one by the magnesium, one by the molybdate method. The report recommends that samples, finely ground by the manufacturer, shall be furnished for analysis and additional samples of the same, coarsely crushed, for determination of water, and that in case of a difference of more than 1½% of calcium phosphate in commercial analyses made by two different chemists, the results shall be submitted to both of them for their opinion as to the cause of difference. The report is signed by five members. (*Chem. News*, *XLIX.* 230.) A. A. B.

On the Estimation of Phosphoric Acid in Fertilizers.

D. Lindo.

A comparison of the oxalic and molybdate methods. The difficulty of removing silica entirely introduces an error which is greater in the oxalic method, but not entirely absent in the molybdate method. Presence of Al and Fe cause precipitation of SiO_2. Aluminium silicate is soluble to a small extent in ammonium citrate, but not in presence of magnesia mixture. In the oxalic method a trace of lime is dissolved from the oxalate by oxalic acid. Reprecipitations after solution in acetic acid, as generally recommended, may be avoided, however, by adding an excess (1.5 to 2 grms.) of citric acid at the proper stage of the process and filtering after 3 to 4 hours with sufficient excess of Mg. mixture. P_2O_5 in presence of ammonium citrate and oxalic acid is precipitated as fully in two hours as in ten. (*Chem. News XLIX.* 247.) A. A. B.

On the Qualitative Examination, and the Quantitative Estimation of As, S, P, and Other Metals in Native Copper.

O. Kuhn.

(*Fres. Zeit. 1884. 165.*)

J. H. S., Jr.

Estimation of Manganese in Cast Iron and Spiegel. C. L. BLOXAM.

The method, which is particularly adapted to estimation of small quantities of iron, depends upon precipitation of iron as phosphate in presence of acetic acid. This precipitate is then dissolved in H Cl, evaporated to separate $Si O_2$, and oxidized with $K ClO_3$; excess of acetic acid is added, then ammonia and excess of $Na_2 H PO_4$. The precipitate is filtered out, redissolved and again thrown down with acetic acid and ammonia; the combined filtrates are boiled to expel NH_3, and now precipitated as crystalline phosphate. The wet filter and precipitate are at once ignited over a Bunsen lamp. Results good.

(*Chem. News L.* 112.)

A. A. B.

Notes on the Volumetric Estimation of Iron. R. W. ATKINSON.

An attempt to account for discrepancies in commercial analyses of iron ores made by different chemists. A series of results is tabulated, showing the errors which arise in standardizing a bichromate solution, when iron or steel of known composition is dissolved in sulphuric acid and titrated directly. The results of this method, which, according to the author, is in very general use, do not agree with those obtained by standardizing with ammonio-ferrous sulphate, nor by solutions of the same steel in nitric acid and subsequent reduction of the iron after evaporation with HCl; the last two methods, however, give concordant results. The difficulty is ascribed to the action of hydrocarbons, produced during solution, upon the solution of dichromate. The results of analyses in the latter case (direct titration) are too low. (*Chem. News, XLIX.*, 117.) A. A. B.

On the use of Rosolic Acid, Methyl Orange, Phenacetoline and Phenol-Phthalein, as Indicators. Part III. R. T. THOMSON.

A continuation of previous papers. The determination of alkaline hydrates in presence of large proportions of carbonates is accomplished by an improved process depending on the insensibility of phenolphthalein to precipitated barium carbonate. A solution of

barium chloride, neutral to phenolphthalein, and of known strength, is added to the alkaline solution and the hydrate present is titrated directly *in the cold*, the latter point being of the utmost importance. Calcium chloride cannot replace the barium salt in this process. Directions are also given for estimation of hydrates in presence of normal sulphates and phosphates of the alkaline metals, for the estimation of bicarbonates in presence of normal carbonates, and for the estimation of alkaline arsenates and arsenites. (*Chem. News*, *XLIX.*, 119.) A. A. B.

Researches on Spectrum Photography in Relation to New Methods of Quantitative Chemical Analysis. Part II. W. N. Hartley.

An abstract of a paper read before the Royal Society. An account is given of the lengths and strength of metallic lines in solutions of definite strength. The sensitiveness of the spectrum reaction obtained by the writer is almost incredible. $\frac{1}{10000000}$ mg. is easily detected, and the delicacy of the reaction is practically unlimited. The spectra of the more strongly basic element exhibits the most persistent lines. Examples are given to show the application of the tables and other data presented, to quantitative work. (*Chem. News*, *XLIX.*, 128.) A. A. B.

Examination of some Musts of 1883, for Acids and Sugar. Wm. Schäfer.

The acid was estimated with $\frac{1}{10}$ normal caustic soda solution, using litmus as indicator, and calculating the result as tartaric acid.

The sugar was estimated with Fehling's solution. For this purpose the must was heated to 80° C, and filtered, and then treated with Fehling's solution.

(*Fres. Zeit. 1884. 172.*)

J. H. S., Jr.

INDUSTRIAL CHEMISTRY.

Superphosphates and Superphosphates. F. J. Lloyd.

The author criticises the results obtained in the agricultural experiments of T. Jamieson carried on for several years in Aberdeenshire and Sussex, England. The analyses of superphosphates used by Jamieson show so large an excess of free sulphuric acid that conclusions against the use of superphosphates in general are not warranted by the results of these experiments. (*Chem. News*, *XLIX*, 229.) A. A. B.

Notes on a Recent Discovery of a Paraffine Shale Deposit in Servia. A. B. Griffiths. (*Chem. News*, *XLIX*., 107.) A. A. B.

On a New Form of Gas Assay Furnace. W. L. Brown.

Not intelligible without the accompanying cut. (*Chem. News*, *XLIX*., 108.) A. A. B.

Notes on the Concentration of Sulphuric Acid. By Peter Hart.

An historical review of methods. Early in this century glass retorts were set in a sand bath, boiled to concentration, allowed to cool, and "*removed in their arms by men* wearing sheepskin aprons," emptied and refilled, to go through the same course. Platinum came very slowly into use. Tennants & Co., of Glasgow, had a platinum retort in use from 1852 to 1864, when it was replaced by the large glass retorts now used. Gossage in 1857 experimented with a tower filled with flints and heated by furnace gases, the forerunner of the present Glover's tower, but it was not successful. Constant-flow systems with glass, earthenware or platinum have not been a success. Concentration *in vacuo* at 300° F. has been proposed. The latest and most remarkable proposal is concentration in *cast iron*. Iron is not attacked by boiling, concentrated acid, and may be used for the later stages of concentration if the acid be saturated with ferrous sulphate, of which it retains only a trace at 66° B. Acid is introduced at 60° B. into a

retort containing a large quantity of hot acid at 66° B., at such a rate that the density of the mixture does not pass below 65° B. This property of sulphuric acid has long been known and is largely applied in the "parting" process for gold alloys. It is remarkable that it should have remained so long without being utilized. (*J. Soc. Ch. Ind. III.*, 6,355.) A. A. B.

On the Quantuative Estimation of Oils and Fats. (Part II.) E. J. Mills and T. Akitt.

Dissolves the oil in CS_2 or CCl_4, preferably the latter, and titrate with Br in solution in the same solvent. Tetrochloride solution of Br is stable for at least twelve weeks. The oil should be as nearly as possible free from water, as the latter increases absorption of Br. 0.5 grm. of the oil is taken, dissolved in 50 c.c. CCl_4. Standard Br is added until a permanent coloration (remaining 15 minutes) is produced. β Naphthol is used to titrate back excess of Br. It forms a monobromo-derivitive in presence of CCl_4. Average probable error is 0.62%, or, with β naphthol 0.46%. Mean strength of standard Br solution, .00644 c.c. grm. per c.c. (*J. Soc. Ch. Ind. III.*, 6,367.)

A. A. B.

Abstracts of Patents Relating to Chemistry.

(*From the Official Gazette of the U. S. Patent Office.*)

May 6th, 1884.

297,971.—Manufacture of artificial stone and marble.—H. A. Daniels.

A mixture of incompatible substances.

297,988.—Apparatus for manufacturing illuminating gas.—A. O. Granger.

A body of coal in a furnace is heated by a blast of air, and the resulting products are burned in a fixing chamber, whereby it is heated. Steam is then decomposed by passage through the heated coal, forming carbonic oxide and hydrogen, which are stored in a holder. They are thence passed to and carbureted in a separate auxiliary hydrocarbon-vaporizer, and the carbureted gas is fixed by passing it through the said heated fixing chamber.

298,026.—Method of manufacturing artificial stone.—M. B. Randle and B. E. Turner.

A partially hardened mass of cement, sand and lime, is subjected to a rubbing operation of cement, lime and water for filling the pores, etc. The stone is finally saturated with lime water.

298,057.—Gas generator and 298,058 Carbureter.—L. C. Beebe.

Hydrogen is evolved from aciduated water and iron scraps, and passed through gasoline or other hydrocarbon.

298,072.—Insulating material.—D. H. Dorsett.

Composed of coal tar, paraffine, silicious sand, and pulverized coal ashes and cinders, black oxide of manganese, and ammonium chloride.

298,101.—Process for the purification of water.—A. R. Leeds.

The water is saturated with oxygen or ozone, by causing it to come in contact, while under artificial pressure and in motion, with compressed air in a system of pipes and air chambers, permitting both air and water to enter under pressure, to move through said system while under pressure, and to be discharged into a suitable reservoir.

298,149.—Process of dissolving metals in ammoniacal solutions.—C. R. A. Wright.

Consists in subjecting fragments of copper, etc., to the action of water, ammonia and a stream of air.

298,165.—Apparatus for extracting cane juice.—G. B. Boomer. Improvement on patent No. 269,628 to same inventor.

The cane is cut into short lengths and submitted to the fumes of burning sulphur, then steamed in a closed tank and finally pressed.

298,175.—Galvanic battery.—C. L. Clarke.

A galvanic cell having an oxide of mercury as the depolarizing agent, and a solution of potassic or sodic hydrate as the exiting fluid.

298,256.—Process of obtaining soda.—J. Townsend.

Kainit is mixed with silica or silica and alumina, the mixture heated and air or steam passed through it, whereby chlorine or hydrochloric acid is evolved. Carbonacious material is mixed with the residue to reduce the sulphates into sulphides. The solutions resulting from the lixiviation of the latter are treated with carbonic acid to form carbonates.

298,281.—Asbestus compound and articles made therefrom.—C. F. Brigham.

Asbestus and magnesia paper pulp incorporated and made plastic to be molded.

298,282.—Fire and waterproof material for roofing.—C. F. Brigham.

Asbestus board or paper treated with silicate of soda and with chloride of calcium.

May 13th, 1884.

298,365.—Metallic alloy for safes.—J. Farrel.

Tin plate scrap, iron and franklinite iron.

298,366.—Rendering goods and fabrics water-proof.—R. S. Forbes.

The goods are soaked in a waterproofing solution composed of vegetable or mineral wax or paraffine dissolved in a light hydrocarbon, dried, steamed, subjected to the action of sulphuric acid, and then washed and neutralized by means of an alkaline solution.

298,426.—Furnace for the manufacture of metals direct from the ore.—J. A. Stearns.

298,462.—Apparatus for generating and carbureting hydrogen gas.—L. S. Groves.

Hydrogen is evolved from iron clippings and carbureted by passing through gasoline.

298,617 and 618.—Method and process of treating cotton seed.—J. F. O'Shaughnessy.

Relates to mechanical processes for separating the fiber from the pulverized hulls.

298,640.—Separating liquid from solid matter and mechanism therefor.—H. Warden.

A filtering press in which successive charges of the liquid are subjected to filtration and pressure.

298,663.—Process and apparatus for extracting gold and silver from their ores.—C. P. Bonnett.

An amalgamation process with electrified mercury.

298,669.—Retort for ammonia ice-making apparatus.—M. S. Conly.

A series of pipes and partitions whereby aqua ammonia is caused to flow in one direction through the retort, and hot water is caused to flow in the other direction, thus subjecting the aqua ammonia to a constantly increasing heat.

298,712.—Apparatus for reducing, refining and separating hydrocarbon oils.—E. W. Strain.

May 20th, 1884.

298,734.—Apparatus for reducing sulphur.—F. Dickert.

A vertical cylinder furnished with strainers and surrounded by a steam jacket.

298,758.—Filter press.—S. H. Johnson.

Suitable projections upon the drainage surface of the press plates cause the one to support the other.

298,816.—Separating the oil from the earth used in refining oils or fats.—M. A. Beal.

Consists in subjecting the fat-saturated earth to boiling in a relatively large body of water and then removing the fat from the surface of the water.

298,941.—Paint.—L. Brown.

Sublimated zinc powder and whiting or other suitable coloring matter and a vehicle.

298,983.—Process of purifying molten iron and steel.—H. Keeler.

Consists in combining them while in a molten state with a mixture formed of pure copper filings and pulverized resin.

298,997.—Electric battery.—O. Millard.

Employs a mixture of lumps of carbon and lead chromate as an electrolyte in connection with an alkaline solution.

298,998.—Obtaining brown dyes from the aromatic diamines.—P. Monnet.

Consists in saturating the material in a bath composed of chlorhydrate of paraphenylene-diamine, or its specified equivalent, sulphuric acid, and water, then wringing, and then treating the material in an oxydizing-bath for developing the color.

299,088.—Composition of matter to be used as a fire and water protective paint.—F. L. Putt and J. B. Stratton.

Coal-gas tar, chloride of sodium, Wisconsin mineral paint, Venetian red, sulphur, resin, asphaltum and other substances too numerous to mention.

May 27th, 1884.

299,167.—Process of bleaching, deodorizing, and sweetening benzine. J. Rowsell.

The petroleum benzine is subjected to successive applications of sulphuric acid, alkali, solution of saltpetre and sulphuric acid, solution of sugar of lead and blue copperas, and finally to the chromates or bichromates of potassium sodium or ammonium.

299,198.—Percolator. C. K. Bradford and J. G. Benedict.

A drug percolator, consisting of a vessel provided with a detachable cover in combination with an air-forcing device.

299,324.—Process of purifying or refining petroleum and other distillable oils. R. Baynes and J. Fearenside, Jr.

Consists in adding to the oil, pulverized dry coke or charcoal impregnated with anhydrous chloride of zinc, until it arrives at the consistency of mud, subjecting it to distillation and then condensing the distillate.

299,337.—Apparatus for washing phosphate rock, ores, etc. F. Brotherhood.

Relates to mechanical arrangements for attaining this object.

299,351.—Compound for cleaning paint. A. S. Cluff.

For cleaning painted surfaces of wood, iron, etc., consisting of lime, borax, sal soda, sapolio, Georgia clay, whiting, ammonia, oil of vitriol, and water.

299,372.—Composition of matter for giving a metallic surface to paper. J. Fransecky.

Argentine, vermillion, silver bronze, glue and water.

299,385.—Process of and apparatus for producing heating gas. H. Haug.

From carbonaceous material and steam or carbonic acid, or mixture of both. Not intelligible without the specification and drawing.

299,388.—Apparatus for the manufacture of nitrocellulose. J. W. Hyatt, F. V. Pool, J. Everding, J. H. Stevens, and W. H. Wood.

Consists of settling tanks, storage tanks, fresh acid tanks, weighing or measuring tanks, temperature regulating pots, converting pots, centrifugal machine, etc.

June 2d, 1884.

299,589.—Gas purifier and method of revivifying iron sponge. O. H. Shiras.

Iron sponge used for purifying gas, after having become fouled, is reoxidized and revivified in the purifying box by means of a current of steam and air blown through it.

299,611.—Process of refining petroleum. L. A. Baker.

Separate crude petroleum into its light and heavy constituents by mixing with snow and filtering off the lighter constituent from the cooled mixture.

299,704.—Dressing compound for threads, yarns, etc. J. S. Wattles.

Composed of starch, flour, grease, spirits of turpentine, or its equivalent, alum water, and paraffine wax.

299,774.—Washing and purifying salt. S. S. Garrigues.

Place the salt in storage bins having perforated bottoms and allow a saturated solution of pure salt to percolate through it.

299,810.—Manufacture of artificial stone. B. Lande.

Cement, and pulverized iron slag.

299,830.—Process of obtaining hydrochloric acid from the residues of ammonia soda manufacture. L. Mond.

Produces hydrochloric acid from these residues containing chloride of ammonium and chloride of sodium, by evaporating them, whereby the chloride of sodium salts act, and treats the remaining product with sulphuric acid.

299,857.—Preparation of collodion. E. Schering.
Not intelligible without the specification.

299,860.—Paraffine freezer. W. C. Scofield.
A hollow disc provided with pipes to supply cooling liquid to the chamber in the disc, and provided with suitable means for sprinkling liquid paraffine on the disc and automaticlly removing it when frozen.

299,900.—Manufacture of glucose. L. Barbier.
Applies the carbonation process or treatment with carbonic acid to the impure syrups obtained by the direct saccharification under pressure of the amylaceous or other materials previously cooked, disintegrated and diluted.

299,919.—Gas generator. P. English.

June 10th, 1884.

300,008.—Carbonic acid gas generator. L. W. Puffer.
For the manufacture of mineral waters.

300,018.—Gasometer for washing carbonic acid gas. R. F. Scannell.

300,023.—Antifriction composition. W. W. Smalley.
Graphite, shellac and gum copal.

300,027.—Apparatus for preparing oxygenated air. A. Stamm.
The combination with an air compresser of two strong closed tanks which are filled with liquids that absorb oxygen in comparatively larger proportion than nitrogen, preferably with water having a layer of oil or glycerine (?) on top.

300,035.—Process of and apparatus for electro-depositing copper, brass, etc. W. H. Walenn.
The solution consists of cyanide of potassium and neutral tartrate of ammonium, charged by electrolysis with the metal or alloy to be deposited and perfected by the addition of cupric ammonide.
The process of electro-depositing metals and alloys by subjecting them to the action of an electro-depositing solution in a closed vessel under a pressure exceeding that of the atmosphere at a temperature of from 190° Fahr. up to the boiling point of the solution.

300,133.—Process of and apparatus for producing cold. J. C. Rossé.
Consists in applying to a liquid a chemical that will produce cold while going into solution therein, using the cold solution thus formed to cool a fresh body of liquid, then dissolving a cooling agent in, and thus further reducing the temperature of the second body of liquid.

300,176.—Galvanic element. W. Wenzel.
The negative electrode, zinc, is contained in a dialyzing cell and immersed in an alkaline solution, in combination with a positive electrode of platinum or carbon immersed in nitric acid of 30° to 40° Beaumé contained in a second porous cell, and a conducting liquid, sulphuric acid of from 50° to 70° Bé. to electrically connect the electrodes through the medium of the constant osmotic exchange between the sulphuric and the nitric acid.

300,190.—Fire extingushing compound. N. G. Bartlett.

A fire extinguishing grenade hermetically sealed containing free carbonic acid gas, together with the alkaline chlorides, and an alkaline chloride in solution therein.

300,281.—Explosive compound. W. R. Quinan.

A low-explosive powder composed of a small proportion of nitroglycerine, carbonaceous material, either pulverized or in the form of non-porous small masses or grains, and an explosive salt in the form of non-porous untriturated small masses, grains or crystals.

300,324.—Alloy for coating metals. C. E. Manby.

Lead from sixty to eighty per cent.; zinc from ten to fifteen per cent.; tin from fifteen to twenty per cent., and nickel from six one-hundredths of one per cent. to one per cent.

300,330.—Process of and apparatus for manufacturing gas. J. L. Stewart.

Consists in producing water gas by the decomposition of steam in contact with heated carbon, drawing such gas while hot directly into a vaporizing and mixing conduit by means of a jet of oil under pressure, and thereby forcing the gas into the vaporizer and carbureting it, and then combining and fixing the mixture in heated retorts.

300,331.—Process of and apparatus for manufacturing gas. J. L. Stewart.

Consists in raising a body of fuel to incandescence by combustion thereof with air and decomposing steam in contact with the incandescent fuel by intermittent operations, and periodically raising and breaking up the body of fuel by sudden puffs or blasts of a gaseous or uniform fluid under high pressure greater than the ordinary air blast.

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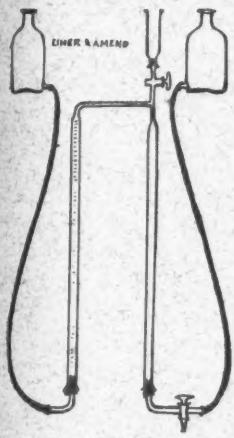

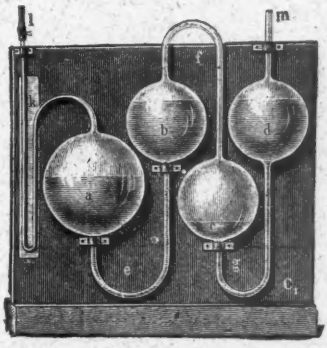

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